

## REMARKS

Claims 1 and 6-9 are all the claims pending in the application. Claim 1 is amended in order to clarify the content of the recited steps.

### *Claim Rejections – 35 USC § 103*

**Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi et al (US 2002/0179576) in view of Dyer et al (US 2002/0151255) and further in view of Ackerman (US 2002/0157421).** This rejection is traversed for at least the following reasons.

The Examiner acknowledges the validity of Applicant's previously argued distinction over Takeuchi in view of Ackerman and/or Taylor. The Examiner now admits that the differences involve a non-contact polishing step of polishing/hydroplane polishing, after the local machining of the flatness control step, the surface of the glass substrate subjected to the local machining by the action of a machining liquid interposed between the surface of the glass substrate and a surface of a polishing tool without direct contact there between bringing the surface of the glass substrate into contact with the surface of the polishing tool, the machining liquid comprising fine powder particles of colloidal silica and an aqueous solution selected from water, an acidic aqueous solution, and an alkaline aqueous solution. The Examiner looks to the newly cited patent to Dyer et al for a disclosure of a CMP method.

However, Applicants respectfully submit that this new combination is not effective under US law to render the claimed invention unpatentable.

#### **Takeuchi et al**

The Examiner asserts that Takeuchi et al discloses "plasma etching/local machining upon the substrate surface having the peaks and valleys ... (page 2, paragraph 0021)".

However, Applicants respectfully submit that Takeuchi et al only disclose at page 2, paragraph 0021 that "plasma etching was carried out [on] the substrate surface". Takeuchi et al does not disclose "the local machining carried out by a gas cluster ion beam or by MRF (Magnetorheological Finishing)." This feature is significant.

#### Use of Ultra-Slow Beam

Where local machining is carried out by a gas cluster ion beam, the cluster comprises a group of several hundreds of atoms or molecules (page 14, lines 17-18 of the present specification). When the local machining is carried out in the manner described on page 14, lines 18-21 of the original specification, irradiation is provided by an ultra-slow ion beam having energy not greater than several tens eV per atom or molecule. Therefore, the surface of the glass substrate is machined with extremely low damage. That is, local machining using the gas cluster ion beam can reduce the roughened surface and the machining-affected layer (the damaged layer) formed on the glass substrate after the local machining (page 14, lines 15-16 of the original specification).

#### Use of MRF

Inasmuch as the plasma etching mainly uses chemical etching action, the machining-affected layer (the damaged layer) formed on the glass substrate after the local machining inevitably increases. In MRF (Magnetorheological Finishing), an object to be machined (glass substrate) is locally polished by bringing abrasive grains contained in a magnetic fluid into contact with the object at a high speed (page 12, lines 23-25 of the original specification). Therefore, in the MRF process, the roughened surface and the machining-affected layer (the damaged layer) formed on the glass substrate after the local machining can be lower than the local machining using the gas cluster ion beam.

#### Polishing Step

The Examiner also asserts that Takeuchi et al disclose “subsequently, subjecting the glass surface to a polishing step (page 2, paragraph 0016)”. However, Takeuchi et al only discloses in page 2, paragraph 0016 that “plasma etching may be followed by a very short time of polishing which does bring substantially little change of flatness”. Takeuchi et al does not disclose polishing the surface of the glass substrate subjected to the local machining carried out by the gas cluster ion beam or by the MRF (Magnetorheological Finishing).

Further, as recognized by the Examiner at page 4, line 20 to page 5, line 6 of the Office Action, Takeuchi et al does not disclose “a non-contact polishing step of polishing, after the local machining of the flatness control step, the surface of the glass substrate subjected to the local machining by the action of a machining liquid interposed between the surface of the glass

substrate and a surface of a polishing tool without bringing the surface of the glass substrate into contact with the surface of the polishing tool, the machining liquid comprising fine powder particles of colloidal silica and an aqueous solution selected from water, an acidic aqueous solution, and an alkaline aqueous solution”.

Nonetheless, the Examiner still states at page 5, line 14 of the Office Action that “Takeuchi et al is concerned with a step of polishing glass”. However, the step of polishing glass **does not follow the local machining** that is carried out by the gas cluster ion beam or by the MRF (Magnetorheological Finishing). Instead, the polishing step in Takeuchi et al follows the plasma etching step. Moreover, the polishing step in Takeuchi is not for polishing the surface of the glass substrate subjected to the local machining carried out by the gas cluster ion beam or by the MRF (Magnetorheological Finishing), as mentioned above.

#### **Dyer et al**

Dyer et al, which is cited for a non-contact polishing step, is nonetheless deficient because it also does not disclose that the non-contact polishing step is for polishing the surface of the glass substrate subjected to the local machining carried out by the gas cluster ion beam or by the MRF (Magnetorheological Finishing). These two sequential steps are essential in combination to achieve the high quality results attained by the inventors.

#### **Conclusions of One Skilled in the Art**

Given the limitations on each of the cited references, one skilled in the art would not have modified the method in Takeuchi by performing a non-contact polishing step of polishing/hydroplane polishing the surface of the glass substrate, as taught by Dyer et al. On this basis, Applicants’ respectfully submit that amended claim 1 is patentable.

#### **Ackerman**

The Examiner looks to Ackerman for a method for producing fused silica glass that includes the use of SiO<sub>2</sub>-TiO<sub>2</sub> glass, particularly the use of a glass substrate made of a SiO<sub>2</sub>-TiO glass in lithography processing

However, this teaching does not remedy the deficiencies of Takeuchi in view of Dyer et al with respect to the combination of a non-contact polishing a surface machined by a gas cluster ion beam or MRF.

**Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi et al (US 2002/0179576) in view of Dyer et al (US 2002/0151255) , Ackerman ((US 2002/0157421) and further in view of Ohnuma (US 6,924,068)).** This rejection is traversed for at least the following reasons.

The Examiner admits that Takeuchi et al in view of Dyer et al and Ackerman does not teach the claimed invention. The Examiner looks to Ohnuma for that teaching. Specifically, the Examiner asserts that Ohnuma discloses a method for fabricating a photomask that comprises the step of patterning the thin film and transferring the thin film pattern of the transfer mask onto a glass substrate by lithography (col. 4, lines 53-60).

Applicants respectfully submit that Ohnuma is cited solely for the foregoing teaching and is not cited to remedy the deficiencies of Takeuchi in view of Dyer et al and Ackerman. Thus, claims 6-8 are also patentable because they depend from the patentable claim 1.

**Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi et al (US 2002/0179576) in view of Dyer et al (US 2002/0151255), Ackerman (US 2002/0157421) and further in view of Ohnuma (US 6,924,068)).**

The deficiencies of Takeuchi as modified by Dyer and Ackerman has been described above. Takeuchi in view of Dyer and Ackerman fails to disclose forming a reflective multilayer on the glass substrate and forming a light absorber film on the reflective multilayer film.

Ohnuma, which is cited solely for its disclosure of a method for fabricating a photomask that comprises the step of forming a reflective multilayer that includes chromium on the glass substrate and the step of forming a photoresist/light absorber film on the reflective multilayer film (col 4, lines 58-62), does not remedy the deficiencies already noted with regard to the invention of claim 1. Thus, Applicants respectfully submit that claim 9 is also patentable because they depend from the patentable claim 1.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

AMENDMENT UNDER 37 C.F.R. § 1.111  
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The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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